

## **DETAILED ACTION**

### ***Examiner's Amendment***

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Donald DiPaula on 03/31/10.

The application has been amended as follows:

Claim 1 has been amended as follow:

A tunable laser, comprising: a multiple ring resonator in which a plurality of ring resonators, which are constituted with ring-type waveguides having optical path lengths different from each other, are **directly** coupled through an optical-coupling device; an LD-side waveguide having a first end connected to one of the plurality of ring resonators through an optical-coupling device; a reflection-side waveguide having a first end connected to other one of the plurality of ring resonators through an optical-coupling device; a single board on which the ring resonator, the LD-side waveguide and the reflection-side waveguide are formed; a reflection film provided to a second end of the reflection-side waveguide, wherein said reflection film comprises a high-reflection film capable of reflecting laser light without regard to a wavelength of a transmission peak of said laser light; a laser diode chip having a low reflection film formed on one of two opposing emission end faces, which is optically coupled to the LD-side waveguide

through the low reflection film; and a tuning device **comprising a plurality of heaters on each of the ring resonators** for changing a resonance wavelength of only the multiple ring resonator, wherein, in the plurality of ring resonators, diameters of the ring waveguides are set so that intervals of reflection peaks appearing periodically become different, and there generates a resonance at a meeting point of the reflection peaks.

Claim 27 has been amended as follow:

A tunable laser, comprising: a multiple ring resonator in which a plurality of ring resonators, which are constituted with ring-type waveguides having optical path lengths different from each other, are **directly** coupled through an optical-coupling device; an LD-side waveguide having a first end connected to one of the plurality of ring resonators through an optical-coupling device; a reflection-side waveguide having a first end connected to other one of the plurality of ring resonators through an optical-coupling device; a single board on which the ring resonator, the LD-side waveguide and the reflection-side waveguide are formed; a reflection film provided to a second end of the reflection-side waveguide, wherein said reflection film comprises a high-reflection film capable of reflecting laser light without regard to a wavelength of a transmission peak of said laser light; a laser diode chip having a low reflection film formed on one of two opposing emission end faces, which is optically coupled to the LD-side waveguide through the low reflection film; and a tuning device **comprising a plurality of heaters on each of the ring resonators** for changing a resonance wavelength of only the multiple ring resonator, wherein the tuning device changes refractive indexes of the

ring-type waveguides of the ring resonators for changing the resonance wavelength, wherein the tuning device changes the resonance wavelength of the ring-type waveguides only by temperature-adjusting a refractive index of each of the ring-type waveguides, and wherein the refractive indexes of each of the ring-type waveguides are temperature-adjusted independently of each other.

Claim 28 has been amended as follow:

A tunable laser, comprising: a multiple ring resonator in which a plurality of ring resonators, which are constituted with ring-type waveguides having optical path lengths different from each other, are directly coupled through an optical-coupling device; an LD-side waveguide having a first end connected to one of the plurality of ring resonators through an optical-coupling device; a reflection-side waveguide having a first end connected to other one of the plurality of ring resonators through an optical-coupling device; a single board on which the ring resonator, the LD-side waveguide and the reflection-side waveguide are formed; a reflection film provided to a second end of the reflection-side waveguide, wherein said reflection film comprises a high-reflection film capable of reflecting laser light without regard to a wavelength of a transmission peak of said laser light; a laser diode chip having a low reflection film formed on one of two opposing emission end faces, which is optically coupled to the LD-side waveguide through the low reflection film; and a tuning device comprising a plurality of heaters on each of the ring resonators for changing a resonance wavelength of only the multiple ring resonator, wherein the tuning device changes refractive indexes of the

ring-type waveguides of the ring resonators for changing the resonance wavelength, wherein, in the plurality of ring resonators, diameters of the ring waveguides are set so that intervals of reflection peaks appearing periodically become different, and there generates a resonance at a meeting point of the reflection peaks.

***Allowable Subject Matter***

Claims 1-5, 7, 10-19, 22, 25, 27 and 28 are allowed.

The following is an examiner's statement of reasons for allowance: claims 1, 27 and 28 are allowable over Ma in view of Chin and Po (reasons for allowance can be found on paragraphs 14-16, page 6, Office action dated 12/15/09). In addition, in view of Examiner's amendment, claims 1, 27 and 28 are also allowable over the Applicant's admitted prior arts Orenstein (US PG Pub 2003/0219045 A1) and Kuipers (GB 2376532 A) because neither Orenstein nor Kuipers disclose the plurality of ring resonators are directly coupled through an optical-coupling device and the tuning device comprising a plurality of heaters on each of the ring resonators. (Both Orenstein and Kuipers fail to teach a coupling device between the ring resonators; Orenstein is silent about any heater on each resonator; and Kuipers only teaches one ring-shaped heater on each ring resonator.) Claims 2-5, 7, 10-19, 22 and 25 are also allowable as they directly or indirectly depend on claim 1.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUANDA ZHANG whose telephone number is (571)270-1439. The examiner can normally be reached on Monday-Friday, 9:00am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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03/31/10

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